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Distribution and occurrence of *Daphnia atkinsoni* Baird, 1859 and *Daphnia similis* Claus, 1876 (Crustacea, Anomopoda) in Hungary

by
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Abstract: *Daphnia atkinsoni* and *D. similis* occur in various kinds of small, temporary water bodies, rarely also in permanent ponds, in the Hungarian Plain. *D. atkinsoni* is a very variable species, it showed considerable morphological variation also in the present material. Body size was in the range of published data in the case of both species. It was found, that *D. similis* inhabits less saline waters, co-occurrence of these species was detected in some pools.
Key words: *Daphnia atkinsoni*, *D. similis*, distribution, seasonality, temporary waters

Introduction

Three species of *Daphnia* (*Ctenodaphnia*) are known from Hungary (Gulyás 1974). *Daphnia magna* is widely distributed in the country. Daday (1900) listed this species as "sat frequens esse videtur". The other two species of the subgenus *Ctenodaphnia* (*D. atkinsoni* and *D. similis*) are less common, particularly the latter one was rarely found.

During 1991 and 1992, within the frames of a project funded by the National Scientific Research Fund (OTKA), I have collected microcrusteaceans from several small, temporary water bodies in the Hungarian Plain. Many of the collected samples contained one, some even both of these species. The purpose of this paper is to summarize Hungarian literature data on *D. atkinsoni* and *D. similis* and to present the results of the more recent collectings.

Materials methods

Collectings were made between March and November in 1991 and 1992. It should be noted, however, that because these years were rather dry, most of the material was collected between March and June. Most water bodies dried out during summer and only a few of them had water again in autumn. Qualitative samples were taken, a plankton net of 100 μ mesh size was used. In some cases, water temperature, pH and conductivity were measured in the field. Body size was also measured and number of eggs per female counted in samples where at least 5-10 specimens could be used for this purpose.

Previous records from Hungary

Daday (1888) compiled the first monograph on the Cladocera fauna of Hungary, in this paper *Daphnia atkinsoni* and *D. psittacea* were listed. The former species was mentioned from six places, three of them are situated in the present-day Hungary, in the Hungarian Plain, while of the four localities of *D. psittacea* one, Kecskemét, is in the Hungarian Plain. In a subsequent publication he reported the occurrence of *D. psittacea* near Kisújszállás (Daday 1891). The specimens were found in small waters in late August. Daday (1893) was the first to study the aquatic microfauna of the sodic waters of the Hungarian Plain. During his survey in summer (July and August) he found *D. atkinsoni* at four sites. These localities ranged fron large permanent ponds to small, astatis sodic pools. Unfortunately, no exact chemical data were given on these localities.

Kottász (1913) also found *D. psittacea* in small pools in the vicinity of Budapest, in October. Woynarovich (1938) dealt with the rotifer and microcrustacean fauna of small, astatic water bodies near Mezőcsát, Northern Hungary lying in the former flood-plain of the river Tisza. The pools represented two different groups, one of them was characterized by turbid, saline (rich in Na and CO_3) water, and in spring *D. psittacea* occurred here in high densities.

Megyeri published several papers on the microfauna of sodic waters of the Hungarian Plain. *Daphnia atkinsoni* was found in various small waters near Szeged between April and June, and *D. psittacea* was recorded in April (Megyeri 1950). Later *D. atkinsoni* was found in several sodic waters near Bugac, between March and May (Megyeri 1958a). Both species were also recorded from dug holes, mainly in spring and after rainfalls. Megyeri (1958b) found *D. atkinsoni* also in the open water of a permanent pond between March and May, however, only few specimens occurred here. Megyeri (1959) summarized his studies on sodic waters, in this paper several localities of these two species were given. *Daphnia atkinsoni* was more frequently found, mostly in spring, but also in autumn, between September and November, while *D. psittacea* occurred in few localities only, between June and September. Also, there was one record from December. Later he reported *D. atkinsoni* from two permanent ponds, where the species occurred in May (Megyeri 1973).

Between 1955 and 1959 Megyeri (1960) carried out hydrobiological investigations on rice fields in Southern Hungary and recorded both species, *D. atkinsoni* occurred at three localities in May and June, *D. psittacea* was found merely at one site in May.

Ponyi & Dvihally (1954) investigated the chemistry and microcrustacean faun of the fish-pond at Kistelek. A part of the pond was sodic, where *D. atkinsoni* and *D. psittacea* were found, the former species in November and then in February and March, while the latter one in April. Later, in another paper their summarized the results of their studies on the sodic waters near Kistelek (Dvihally & Ponyi 1957), a list containing 83 microcrustacean species was given. *Daphnia atkinsoni* was listed and also the curious record of *D. carinata*, very likely this might have been *D. similis*. The investigated waters were classified based on their chemical and faunal features, and *D. atkinsoni* was considered one of the typical species of sodic waters with Na, CO_3 and HCO_3 dominance.

Ponyi & Kertész (1967) also found *D. atkinsoni* at Farmos in April, May, and in November. Nógrády (1956) recorded both species in sodic waters near Fülöpszállás, they occurred in April and May, and were considered characteristic for these waters. Bothár & Oertel (1977) investigated the *Sphagnum*-moor near Egerbakta and found four cladoceran species. One of them was *D. atkinsoni* occurring in the lagg zone in April. The authors considered its occurrence sporadic and occidental.

More recently Forró (1989) studied the microcrustacean faune of sodic waters near Fülöpháza and found *D. atkinsoni* in a small, astatic pond in March.

Unfortunately, none of the authors mentioned above gave a morphological description of the specimens they had collected. The only exception is Daday (1888), however, he described the species very briefly and the illustrations also are of limited value. Thus it is a difficult task to figure out what taxon was indicated by the name *Daphnia psittacea*. For example, it is very likely that Woynárovich (1938) recorded *D. atkinsoni* as other authors found this species in sodic waters in spring. On the other hand, I think, when both species were reported in a paper, most probably *D. psittacea* should be considered as a synonym of *D. similis*. Although, because *D. atkinsoni* is a very variable species, as it was noted by many authors (e. g. Hrbácek 1987), it cannot be completely excluded that forms of this species were misidentified as *D. psittacea*.

Results and discussion

Material examined:

Daphnia atkinsoni Baird, 1859: Angyalháza, reconstructed pool, 24. 03. 1992; Balmazújváros, Nagyszik, small pool, 05. 06. 1991(E)[1]; Balmazújváros, Nagyszik, several pools, 24. 03. 1992, 08. 04. 1992 (E), 22. 04. 1992 (E), 29. 04. 1992 (E); Furta, small pool on pasture, 21. 03. 1991 (E); Furta, turbid pool on pasture, 07. 06. 1992; Fülöpszállás, Kelemenszék, 09. 03. 1992, 24. 03. 1992, 21. 11. 1992; Nagyiván, small pool, 23. 03. 1992 (E); Nagykunsági puszta, pools on pasture near 74th kilometre stone of mainroad 4; Poroszló, small pools in wheel-tracks, 08. 06. 1991; Tiszacsege, small pool, 08. 06. 1991 (E); Tiszaug, small dug hole with brownish water, 23. 03. 1992.

Daphnia similis Claus, 1876: Angyalháza, reconstructed pool, 24. 03. 1992; Balmazújváros, Nagyszik, small pool. 05. 06. 1991; Balmazújváros, Nagyszik, small pools 08. 04. 1992, 24. 04. 1992, 29. 04. 1992; Berettyóújfalu, roadside pool, 07. 06. 1991 (E); Furta, small pool on pasture, 21. 03. 1992 (E); Tiszafüred, pool on arable land, 08. 06. 1991 (E); Tiszavasvári, small pool in wheel-track, 24. 06. 1992.

Notes on the morphological variation of *Daphnia atkinsoni*

Daphnia atkinsoni is a very variable species and there is no clear definition of it. The authors are of different opinion, e.g. Hudec (1981), in addition to the earlier synonyms, included *D. ulomskyi* Behning also into the synonymy of *D. atkinsoni*, while Alonso (1991) considered *D. bolivari* as distinct species, not a form of *D. atkinsoni*. The material investigated was also quite variable. A detailed morphological analysis will be published elsewhere, here I just want to note, that size and shape of rostrum, height and width of the head, size of the anterior extension of the carapace and the spinulation of its suture, size of the shell spine varied to a great extent. The presence of well visible spines on the suture of the anterior extension of the carapace was more characteristic in specimens collected in June, similar varieties were observed by Kubicek (1959) in Moravia. Frequent sampling and detailed investigation were needed in order to be able to decide if different forms of the same species or different species occur after each other in these cases.

[1] „E" indicates gamogenetic populations.

Body size and number of eggs

Table 1 shows body size for both species in different months. These results correspond more or less to the size range given by Hrbácek (1987) for these taxa. Parthenogenetic females of *D. atkinsoni* had largest body size in March, while ephippial females were largest in June. The shell spine was longer in June than in the spring.

Largest body size for *D. similis* was found in April. The shell of this species was longest in June usually, while it was short in March. Specimens from larger and deeper waters had shorter spines, and it was longer in a population from a very shallow pool.

The number of eggs varied between 2 and 29 in *D. similis*, the greatest number was found mostly in March, it was changing between 10 and 26. In June was it much smaller, varying between 2 and 7.

D. atkinsoni had higher number of eggs. Maximal numbers were found in March, in the population from Nagykunsági puszta it varied between 24-61, while in samples from Balmazújváros and Kelemenszék between 13 and 44, averages were 21 and 40, respectively. The clutch size was much smaller in June, changing between 9 and 16.

Table 1. Body length (mm) and proportion of shell spine to total length (in parentheses) of *Daphnia atkinsoni* and *D. similis*

Daphnia atkinsoni				*Daphnia similis*			
	March	April	June		March	April	June
parth. female	2.529 (18)	2.338 (17)	3.686 (23)	parth. female	3.076 (19)	3.489 (35)	3.169 (26)
	3.575 (20)	2.913 (17)			4.073 (22)	4.843 (37)	3.366 (33)
	3.750 (25)	2.944 (18)			4.270 (30)		3.953 (35)
ephip. female	2.061 (18)	2.369 (18)	2.646 (30)	ephip. female			3.107 (28)
	2.369 (18)		2.695 (31)				3.181 (32)
			2.870	male	1.981 (26)		
male		1.569 (25)	1.673 (30)				

Environmental conditions

One characteristic feature of most waters sampled was that they were turbid and shallow, some of them only a few centimeters deep. In some cases the two species occurred in the same sample, however, based on the pH and conductivity, they seem to be different in their habitats. *D. atkinsoni* was found in a relatively high pH range (7.99-9.09) and in more saline waters, the conductivity range I recorded was 91-2260 µS. *D. similis* was found between 91-1260 µS, with most sites below 1000 µS. The sampling site of the lowest conductivity was at Furta, 21. 03. 1991, where both species occurred.

Accompanying fauna

Temporary pools have a characteristic Branchiopoda fauna, and the two *Daphnia* species under consideration belong to this group. *Branchinecta ferox*, *Streptocephalus torvicornis*, *Triops cancriformis* very often co-occurred, of the Anomopoda more frequently two *Moina* (*M. brachiata, M. macrocopa*), in some cases both species, and *Macrothrix hirsuticornis* were found in the samples containing *D. atkinsoni* and/or *D. similis*. These communities are very similar to those reported by e. g. Hollwedel (1975) and Hudec (1981).

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